Pseudoplasmopora (Cnidaria, Tabulata) in the Siluro-Devonian of Eastern Australia with comments on its global biogeography

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Földvary, G.Z. (2006). *Pseudoplasmopora* (Cnidaria, Tabulata) in the Siluro-Devonian of eastern Australia with comments on its global biogeography. *Proceedings of the Linnean Society of New South Wales* **127**, 175-189.

The tabulate coral *Pseudoplasmopora* is widely distributed in Eastern Australia, China, central and southeastern Asia, the Rhenish-Alpine region of central Europe, Gotland and eastern U.S.A. Occurrences of the genus in Australia are reviewed: *Pseudoplasmopora follis, P. heliolitoides* and *P. gippslandica* are reassessed, and *Pseudoplasmopora* sp. A and B are discussed in open nomenclature. During Late Silurian times *Pseudoplasmopora* was confined to Eurasia (predominantly Kazakhstan), eastern Gondwana (Tasman Fold Belt of eastern Australia), South China, Gotland and eastern Laurentia. Though disappearing from the latter two regions before the end of the Silurian, elsewhere during the Early Devonian *Pseudoplasmopora* underwent considerable biogeographic expansion, particularly within China and central Europe, whilst persisting in eastern Gondwana. The youngest species are of Eifelian age. This widespread record suggests that it may have potential in palaeobiogeographic analysis of the mid-Palaeozoic continental distribution.

Manuscript received 16 February 2005, accepted for publication 7 December 2005.

KEYWORDS: Biogeography, Devonian, Gondwana, heliolitine corals, Silurian, systematics.

INTRODUCTION

The Early Silurian to Middle Devonian heliolitine coral *Pseudoplasmopora* Bondarenko, 1963 is widely distributed within the Tasman Fold Belt from Queensland to Victoria. In this paper, all Australian species attributed to this genus are reviewed. Species previously recognised in this region, though referred at the time of original description to other genera such as *Plasmopora* and *Heliolites*, include *Pseudoplasmopora follis* (Milne-Edwards and Haime, 1851), *P. heliolitoides* (Lindström, 1899) and *P. gippslandica* (Chapman, 1914). These species are here redescribed, and two other forms – *Pseudoplasmopora* sp. A and B – are discussed in open nomenclature.

Pseudoplasmopora is also known from central Asia (Kazakhstan) from where it was first distinguished by Bondarenko (1963), who additionally included in this genus some species from Australia, Gotland and eastern U.S.A. that had previously been assigned to *Plasmopora.* Subsequently *Pseudoplasmopora* has been identified in China and central Europe (Rhenish – Alpine region). During Silurian times *Pseudoplasmopora* was confined to Eurasia, eastern Gondwana, South China, Baltica and eastern Laurentia (Figure 1). Although disappearing from the latter two areas by the close of the Silurian, during the Early Devonian it underwent considerable biogeographic expansion (Figure 2), prior to becoming extinct in the Middle Devonian (Eifelian). A review of all known occurrences suggests that *Pseudoplasmopora* may have potential in palaeobiogeographic analysis of mid-Palaeozoic continental distribution. The local species *P. gippslandica* in particular seems to be widespread, having been additionally recorded from Kazakhstan and central Europe.

GLOBAL BIOGEOGRAPHIC DISTRIBUTION

Bondarenko (1963) established *Pseudoplasmopora* on basis of two species, the type *P. conspecta* and *P. arguta* from central Kazakhstan. Interestingly he also assigned some Australian forms to this new genus, recognizing *P. gippslandica* (Chapman) from the northern slopes of the Tarbagatai Mountains near the mining town

of Karajal (Karadzhal) and the Nura Synclinorium in the Karaganda region (composed mainly of Silurian to Lower Devonian formations). Kovalevsky (1965) described further new Late Silurian species of *Pseudoplasmopora*: – *P. bella, P. karaespensis, P. subambigua* and *P. subdecipiens* – from the Lake Balkhash area of Kazakhstan. Bondarenko (1967) reported on the distribution of these species in Kazakhstan, and subsequently Bondarenko (1975) described further new species from central Asia, including *P. dzhungaria, P. isenica*, and *P. septosa*.

Numerous species of *Pseudoplasmopora* have been described from China. Lin et al. (1988) showed that the genus was widespread there, with the recognition of *P. aseptata* (Regnéll, 1941) and *P. microsa* Wang, 1981 from the eastern Tien-Shan Mountains in strata now known to be of Lochkovian (Early Devonian) age, and *P. shiqianensis* Yang, 1978 from probable Late Silurian rocks of South China. More recently, several Early Devonian species from the Jilin province of North China were described including *P. turpanensis* Deng, 1997, *P. aseptata minor* Deng, 1997 and *P. yaokengensis* Deng, 2000. Deng (in Deng and Zheng 2000) compared *P. yaokengensis* with *P. regularis* (Dun) [= *P. gippslandica* herein] noting that the latter has larger corallites that are usually separated by two rows of tubuli.

Amongst the youngest species referable to the genus are those known from central Europe, in Early to Middle Devonian strata. A new undescribed species is present in the late Emsian to early Eifelian of the Rhenish Schiefergebirge, and Ghassan (1971) documented the occurrence of *P. gippslandica* from Eifelian-age rocks of the Carnic Alps in Austria.

Species originally placed in *Plasmopora*, such as *P. follis* (Milne-Edwards and Haime, 1851) and *P. heliolitoides* (Lindström, 1899) from the Late Silurian of eastern U.S.A. and Gotland, respectively, appear to have received little systematic attention since their initial descriptions, apart from their reassignment to *Pseudoplasmopora*.

Australian heliolitines now referred to *Pseudoplasmopora* were first described by Chapman (1914), Dun (1927) and Jones and Hill (1940). Hill et al. (1969) documented several informally assigned species with annotated illustration, in the same year that *P.* sp. cf. *P. gippslandica* was described by Jell and Hill (1969). Földvary (2000) illustrated *P.* sp. from central New South Wales. Useful biostratigraphic data on Silurian species of *Pseudoplasmopora* in eastern Australia was presented by Munson et al. (2000), based on a then-unpublished compilation by Pickett (subsequently made available via Internet access in 2002). Published species of *Pseudoplasmopora* from Australia include *P. follis* (Milne-Edwards and Haime, 1851), *P. heliolitoides* (Lindström, 1899), *P. gippslandica* (Chapman, 1914), and two informally-designated species illustrated by Hill et al. (1969).

Kaljo and Klaamann (1973) and Pickett (1975) briefly mentioned the distribution of *Pseudoplasmopora* in relation to Silurian coral biogeography (though surprisingly the genus was indicated to be endemic to central Asia, despite Bondarenko's earlier identification of the Australian species *P. gippslandica* in Kazakhstan, and recognition of Queensland occurrences by Hill et al. 1969). Since then much new information has come to light regarding mid-Palaeozoic palaeogeography, that when combined with increased knowledge of the world-wide distribution of *Pseudoplasmopora* – here plotted on two terrane maps for the Late Silurian and Early Devonian respectively (Figures 1 and 2) – allows a more complete picture of biogeographic relationships between regions where this genus occurs. The distribution of *Pseudoplasmopora* reveals its restriction predominantly to the terranes of central Asia, China, and the Tasman Fold Belt of eastern Australia, with an additional group of occurrences in Baltica (Gotland) and eastern Laurentia. It might be expected to also be found in terranes forming southeast Asia, providing a link between eastern Australia and China, but no records are currently known of *Pseudoplasmopora* from this region.

During the Early Silurian to Early Devonian interval, *Pseudoplasmopora* was distributed between 30° N and 30° S palaeolatitudes, encompassing (1) eastern Gondwana (eastern Australia: Hill, 1978, 1981; Munson et al. 2000), (2) terranes and continental blocks in eastern and central Asia (Kazakhstan, North and South China: Bondarenko, 1963, 1975; Lin et al., 1988), (3) Baltica and (4) eastern Laurentia, confined to Silurian beds. As shown on the terrane reconstruction maps of Cocks and Torsvik (2002), by the Early Devonian Gondwana had shifted clockwise south-eastwards by 90° (Figure 2). Concurrently the blocks of North and South China and South-East Asian terranes became more separated from Gondwana, though remaining near the equator. Such dispersal brought about changes in the distribution of *Pseudoplasmopora,* partly retreating (from Laurentia and Baltica), and elsewhere expanding in space and time into Central Europe where it survived into the early mid-Devonian. The Australian part of Gondwana remained below 30° S, which explains the continued presence of *Pseudoplasmopora* in eastern Australian localities (Figure 2; Cocks and Fortey, 1990).

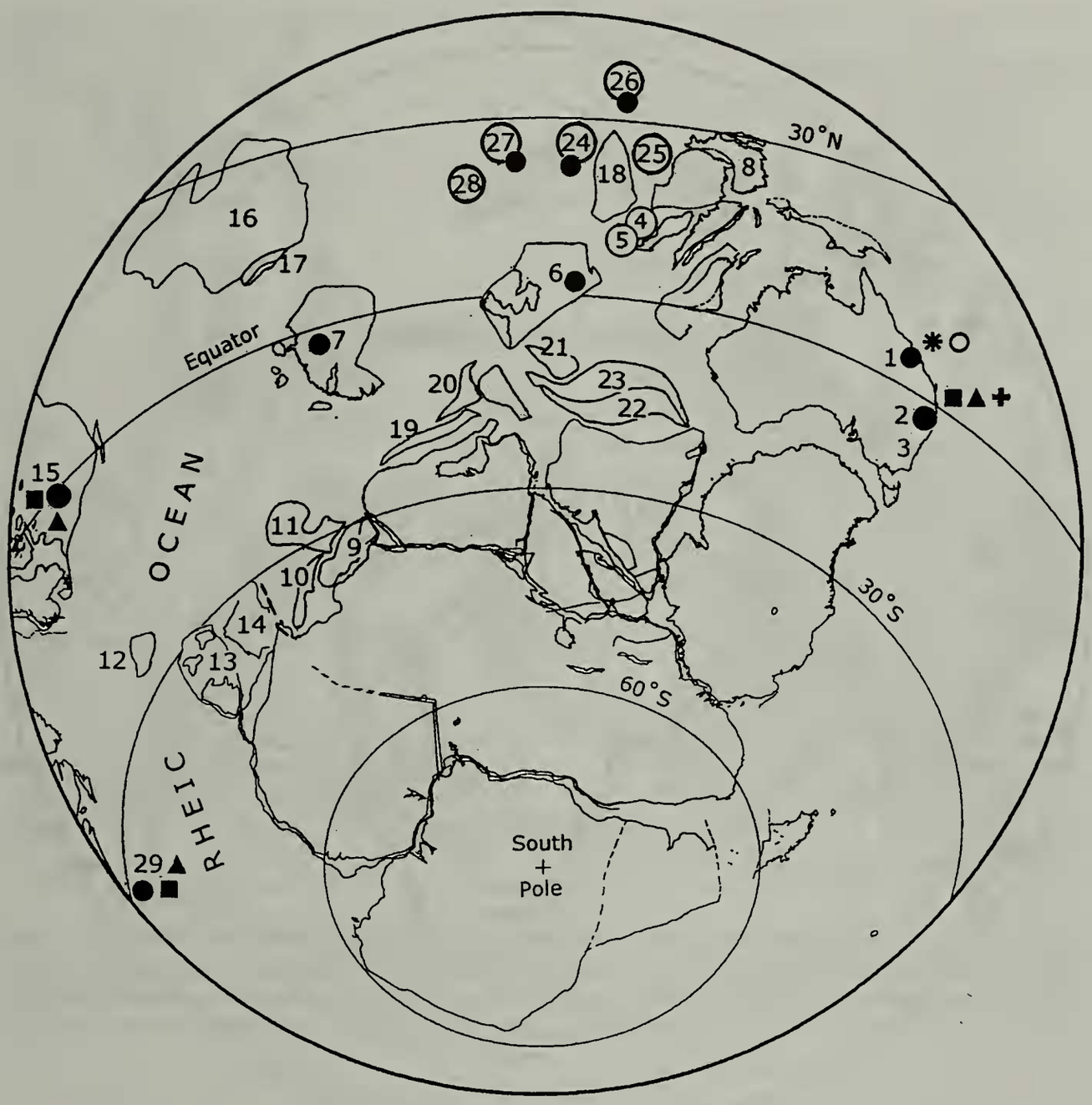

Figure 1. Distribution of Late Silurian *Pseudoplasmopora* occurrences (indicated by ● and terrane numbers) throughout the world, based on the terrane reconstruction map of Cocks and Torsvik (2002); Lambert Azimuthal Projection centred 30° Long., -40° Lat.
Symbols for the Australian species are:
■ = *P. follis*, ▲ = *P. heliolitoides*, + = *P. gippslandica*, O = *P.* sp. A, ❁ = *P.* sp. B.
Microcontinents and terranes shown thus:
(1) Queensland, (2) New South Wales, and (3) Victoria of Australia, (4) Annamia, (5) Sibumasu, (6) North China, (7) South China, (8) Japan, (9) Taurides and (10) Pontides of Turkey, (11) Hellenic Terrane, (12) Perunica, (13) Armorica, (14) Iberia, (15) Baltica (Gotland and eastern Europe), (16) Siberia, (17) Taimyr and the Kara Block, (18) Tarim, (19) Sanand and (20) Alborz of Iran, (21) Afghan Terrane, (22) South Tibet, (23) Qintang (Qiangtang, Qantang), (24) Tien Shan Mtns., (25) Mongolia (inner part), (26) Altai Mtns. and the Tuva Terrane, (27) Kazakhstan, (28) Uzbekistan, (29) Eastern Laurentia (Michigan, Tennessee).

Figure 2. Distribution of Early Devonian *Pseudoplasmopora* occurrences (indicated by ● and terrane numbers) throughout the world, after the terrane reconstruction map of Cocks and Torsvik (2002); Lambert Azimuthal Projection centred 40° Long., -40° Lat.

Symbols for the Australian species are: ■ = *P. follis*, ▲ = *P. heliolitoides*, + = *P. gippslandica*.
Microcontinents and terranes shown thus:
(1) Queensland, (2) New South Wales, and (3) Victoria of Australia, (4) Annamia, (5) Sibumasu (Shan-Thai), (6) North China, (7) South China), (8) Taurides and (9) Pontides of Turkey, (10) Hellenic Terrane (including the Carpathian Basin and Dinarids), (11) Perunica (Bohemia), (12) Armorica, (13) Iberia, (14) Rhenish-Alpine area of Central Europe and Podolia (15) Siberia (Platform) and Kuzetsk Basin, (16) Taimyr, (17) Tarim, (18) Sanand and (19) Alborz Terranes of Iran, (20) Afghan Terrane, (21) South Tibet, (22) Qintang (Qiangtang, Qantang), (23) Tien Shan Mtns., (24) Mongolia, (25) Altai Mtn. Range, (26) Kazakhstan with Tarbagatai Mtn. further south-south east, (27) Uzbekistan, (28) Laurentia.

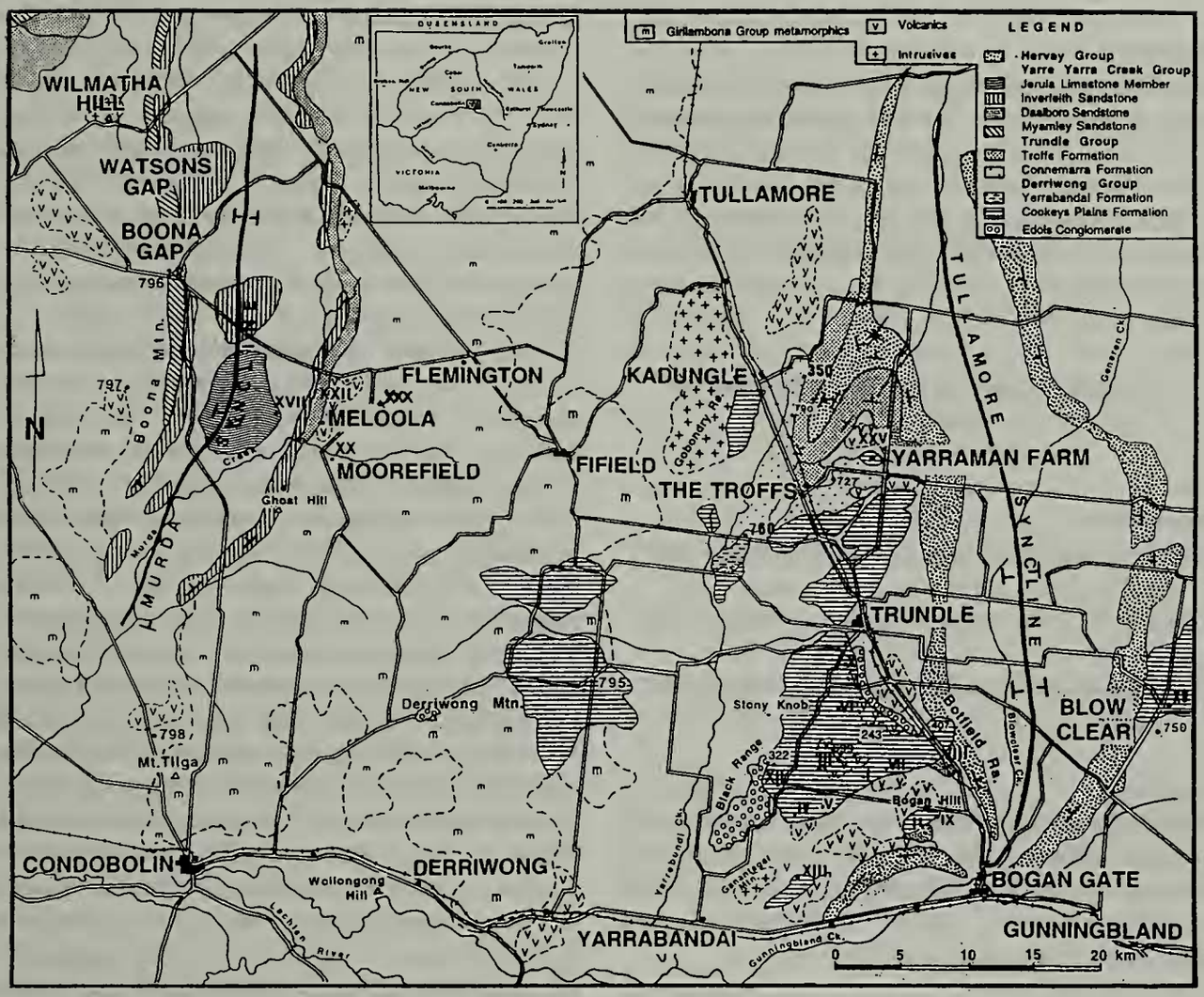

Figure 3. Simplified locality and schematic geological map of the Trundle – Condobolin area of central New South Wales, showing the occurrence of the more important fossil localities. Based on the Narromine 1:250,000 Geological Map (Sherwin, 1996) and the Forbes 1:250,000 Geological Map (Duggan et al. 1999). Fossil localities are indicated by Roman numerals I to XXX, less important ones by Arabic numerals.

SYSTEMATIC PALAEONTOLOGY

NOTE: TABLE 1 AND FIGURES 4-8 ARE AT THE END OF THE PAPER

All new specimens are housed in the Australian Museum, Sydney; catalogue numbers prefixed by the acronym AMF refer to specimens, those prefixed AM to thin sections. Listed and illustrated specimens or thin-sections from the New South Wales Geological Survey are prefixed by MMF, those from the University of Queensland are designated UQF. Stratigraphical and locality details for the Central West area of New South Wales are given in Földvary (2000) and shown herein in Figure 3. The classification follows Hill (1981) with updated zoological nomenclature as recommended by the ICZN (4th edn. 2000).

Table 1 provides a concise summary of the principal distinguishing features of those species described below.

Suborder **Heliolitina** Frech, 1897

Superfamily **Heliolitoidea** Lindström, 1876
Family **Pseudoplasmoporidae** Bondarenko, 1963

Genus ***Pseudoplasmopora*** Bondarenko, 1963

Type species
Pseudoplasmopora conspecta Bondarenko, 1963. Late Silurian (Ludlow) age, from the top of the Isen Suite, southern border of the Karaganda Basin, Akbastau, Central Kazakhstan [Note that Hill (1981) assigns an Early Devonian age to the type horizon].

Diagnosis
Pseudoplasmoporidae with tabularium surrounded by an aureole of mostly 12 tubuli of varying diameter, with coenenchyme composed of tubuli of almost the same diameter. Tabularia and tubuli walls thin and smooth, diaphragms in the tubuli are horizontal and complete, rarely oblique or incomplete. Septa, when present, appear as septal spines, but they are often absent (after Hill, 1981, p. 609).

Pseudoplasmopora follis (Milne-Edwards and Haime, 1851)
(Figures 4, A – F; 8, E - F)

Synonymy
Plasmopora follis Milne-Edwards and Haime, 1851, p. 223, pl. 16, figs. 3, 3a.
Plasmopora follis Lindström, 1899, p. 82, pl. 7, figs. 19-20.
Pseudoplasmopora sp. nov. Hill et al. 1969, pl. III, fig. 6.

Diagnosis
Pseudoplasmopora with dense tabularial spacing; average tabularium diameter of 1.0 mm, surrounded by aureole formed by 12 regularly polygonal tubuli of smaller diameter; tabulae in the tabularia and diaphragms in the tubuli are closely spaced.

Description
Tabularia spaced between 0.7 and 2 mm apart (measured between centres) and number 25 – 30 per cm^2 within the coenenchyme. Diameter of tabularia 0.9 – 1.1 mm, each contain 10 – 15 tabulae in 5 mm. 12 polygonal tubuli form the aureole to each tabularium; tubuli in coenenchymal tissue are also polygonal, their diameter is 0.1 – 0.2 mm; diaphragms within tubuli number 15 – 16 in 5 mm. Septa form node-shaped swellings, sometimes with blunt rounded spines.

Remarks
In Lindström's type material of *P. follis* the diameters of tabularia and coenenchymal tubuli are intermediate between those of Bondarenko's (1963) two original species, *P. conspecta* and *P. arguta*. The type species *P. conspecta* has tabularial diameters of 0.7 – 0.8 mm, those for *P. arguta* 1.0 – 1.1 mm. *Pseudoplasmopora dzhungaria* Bondarenko, 1975 has tabularial diameters of 0.8 – 0.9 mm, and the diameter of the tubuli is 0.1 - 0.15 mm; tabularia are surrounded by 12 (occasionally 13) tubuli: values which are comparable with *P. follis*. Of Chinese species, *Pseudoplasmopora aseptata* (Regnéll, 1941) has tabularial diameters of 0.8 – 1.2 mm with 2 to 4 tubuli (4 to 6-sided) interposed between tabularia, whereas *P. shiqianensis* Yang, 1978 has tabularia 0.75 – 0.85 mm in diameter, spaced 0.4 – 0.8 mm apart (measured between centres); *P. microsa* Wang, 1981 has tabularial diameters of 0.5 – 0.7 mm (Lin et al. 1988). Tabularia of the latter two species are considerably smaller in diameter than those of *P. follis,* while those of *P. aseptata* are practically identical in size.

In Australia *Pseudoplasmopora follis* occurs mainly in the Late Silurian Bowspring Limestone and Hume Limestone Members of the Silverdale Formation (Gorstian and Ludfordian) at Hattons Corner, south of Yass, New South Wales (Munson et al. 2000). Additional unconfirmed, undescribed occurrences recorded by Munson et al. (2000) include: (1) limestone lenses of the Mirrabooka Formation west of Orange, (2) Borenore Limestone, west of Orange, (3) Jenolan Caves Limestone at Jenolan Caves near Oberon, and (4) Quidong Limestone at Delegate, near the Victorian border of New South Wales. Further specimens, listed below, are known from Siluro-Devonian strata in the Trundle – Condobolin district of central western New South Wales. A species from Queensland, unnamed at the time of its illustration by Hill et al. (1969) but thought by them to represent a new species, is here assigned to *P. follis* on basis of characters including the presence of uniformly polygonal tubuli in both the aureole and coenenchyme (UQF60059, here shown on Figure 8).

Material
AMF105567 (cf. Figures 4 and 8), a complete colony, 12x12x6 cm in size, and AMF105568 are from Loc. XXX; AMF116146, AMF116148, AMF116149 and AMF116150 are from Loc. XX, 5 km SW of Loc. XXX. These localities are about 40 km NNE of Condobolin, New South Wales, near "Meloola" Homestead and "Moorefield" Station respectively (Figure 4, A – D). Both localities are in the Meloola Volcanics of Cookeys Plains Formation, Derriwong Group, of Pridolian age. MMF31447 is from a locality 3.5 km west of "Moorefield" Station, also in the Meloola Volcanics, of Pridoli age (Pickett and McClatchie, 1991 – listed by them as *Pseudoplasmopora* sp. and not previously figured).

Pseudoplasmopora heliolitoides (Lindström, 1899)
(Figure 5, A – F; 6, A - F)

Synonymy
Plasmopora heliolitoides Lindström, 1899, p. 86, pl. 7, figs. 32-33.

Heliolites distans Dun, 1927, p.258, pl. XIX, figs. 3-6.
Heliolites distans var. *humewoodensis* Dun, 1927, p. 261, pl. XX, figs. 3, 4.
Heliolites distans var. *intermedia* Dun, 1927, p. 261, pl. XX, figs. 5, 6.
Heliolites distans var. *minuta* Dun, 1927, p. 262, pl. XXI, figs. 1-4.
Plasmopora heliolitoides Jones and Hill, 1940, pl. IX, figs. 4 and 5; pl. X, figs. 1-4.
Pseudoplasmopora sp. Földvary, 2000, p. 91, fig. 8, 3 - 4.

Diagnosis
Pseudoplasmopora with aureole of tabularium composed of tubuli of irregular shape and varying size. Septa absent or appear in form of blunt swellings.

Description
Tabularia spaced 1.5 – 5 mm apart, characteristically 5 – 7 tabularia per cm²; each tabularia 1.0 – 1.75 mm in diameter, with 12 – 16 tabulae in 5 mm. Aureole formed by 12 polyhedral tubuli, each 0.25 – 0.30 mm in diameter. Tabularia walls 0.05 mm thick, more than twice the thickness of the tubuli walls (0.02 mm). Diaphragms in tubuli are spaced 15 in 5 mm. Septal spines, when present, dilated at the base.

Remarks
The main distinctions between *Pseudoplasmopora heliolitoides* and *P. follis* from the Trundle – Condobolin area are differences in tabularial spacing (measured from centre to centre of adjacent tabularia), and their density within the coenenchyme. The average tabularial spacing in *P. heliolitoides* is 0.8 mm, closer than in *P. follis*. *Pseudoplasmopora heliolitoides* has only 5 to 7 tabularia per cm², whereas *P. follis* is crowded with tabularia. Their diameter is distinctly larger (1.0 – 1.3 mm) in *P. heliolitoides* compared to *P. follis* (0.9 – 1.1 mm). Parameter ranges for *P. heliolitoides* given by Jones and Hill (1940) are 1.0 – 1.75 mm for tabularia diameters, 1.5 – 5.0 mm for tabularial spacing, and 12 – 16 tabulae in 5 mm.

Additional Material
Pseudoplasmopora heliolitoides occurs in limestone lenses of latest Silurian (Pridoli) age (*eosteinhornensis* Zone) in the Meloola Volcanics, Cookeys Plains Formation, Derriwong Group, about 40 km north-north-east of Condobolin (Munson et al, 2000; Földvary, 2000). AMF69668 (Figure 5, A-D), from which a number of transverse and longitudinal thin sections have been prepared (AM 13547, AM13635-AM13637, AM13772-AM13774) is from Loc. XX, 33 km north-north-east of Condobolin, situated east of the road, and 0.5-1 km east of 'Moorefield' Station (Földvary, 2000). AMF78962 from the Yass area (Figure 5, E-F) comes from beds of slightly older (Ludlow) age.

Pseudoplasmopora gippslandica (Chapman, 1914)
(Figure 7, A – D)

Synonymy
Heliolites interstincta Linné, var. *gippslandica,* var. nov. Chapman, 1914, Pl. LX, figs. 35-36.
Heliolites regularis Dun, 1927, p. 256, pl. XVIII, figs. 2, 3.
Plasmopora gippslandica (Chapman, 1914), Jones and Hill, 1940, p. 206, pl. X, fig. 5, pl. XI, fig. 1.
Pseudoplasmopora gippslandica (Chapman, 1914), Bondarenko, 1963, p. 1863.
Pseudoplasmopora sp. cf. *gippslandica* Jell and Hill, 1969, p. 23, p. 9, fig.10a, b.
Pseudoplasmopora gippslandica (Chapman, 1914), Ghassan, 1971, p. 593, pls. 1-2.

Diagnosis
Characterized by elongated tubuli in the tabularium, continuous walls and the absence of septa. Aureole consists of 12 tubuli, usually with two rows of tubuli between tabularia.

Description
Diameter of tabularia 1.25 – 1.75 mm. Tabulae strongly concave, 20 – 25 in 5 mm. Within tubuli are 20 – 35 diaphragms in 5 mm. Septa absent.

Remarks
Pseudoplasmopora gippslandica (Chapman, 1914) occurs in eastern Australia in a number of localities from Queensland to Victoria. Although documented from Hattons Corner, Yass area, in Late Silurian strata (Dun, 1927), other Silurian occurrences are mentioned only in unpublished works listed in Munson et al. (2000). Otherwise this species is mainly restricted to the Devonian. New South Wales occurrences are mostly from Lower Devonian beds, and in Victoria it is known from Lower Devonian limestones at Cave Hill, Lilydale and Waratah Bay. A comparable species, *P.* sp. cf. *P. gippslandica* was described by Jell and Hill (1969) from beds of Eifelian age from Ukalunda near Bowen in Queensland. Bondarenko (1963) noted that *P. gippslandica* differed from his type species *P. conspecta* only by the coenenchymal tubuli having thickened walls, considered to be a Devonian trait (Hill, 1967).
Ghassan (1971) illustrated *P. gippslandica*? from the

Middle Devonian (Eifelian?) of the Carnic Alps in Austria. The 12 tubuli forming the aureole are slightly larger than the coenenchymal tubuli, and there are two to three tubuli between the tabularia. This description conforms to *P. gippslandica*.

Material
Specimens shown in Figure 7: AMF5512 (AM66) near Rockhampton, Queensland, and AMF6936 (AM271), Nundle Road, near Tamworth, New South Wales.

***Pseudoplasmopora* sp. A**
(Figure 8, A – B)

Synonymy
Pseudoplasmopora sp. cf. *P. heliolitoides*; Hill et al. (1969), pl. III, fig. 7.

Description
Pseudoplasmopora with tabularia 1.0 – 1.2 mm in diameter, spaced 12 – 15 per cm², and having 14 – 16 tabulae in 5 mm; tabularial walls thin, maximum 0.05 mm. The 12 irregularly polyhedral tubuli forming the aureole are clearly differentiated from tubuli of the coenenchymal tissue which are 0.3 – 0.6 mm in diameter, with 8 – 10 diaphragms in 5 mm. In transverse section many tubuli, both tabularial and coenenchymal, appear to have small bud-like structures internally. Septa when present are blunt.

Remarks
With tabularial diameters of 1.0 – 1.2 mm *Pseudoplasmopora* sp. A is comparable with *P. follis* but is readily distinguished from that species in displaying tubuli in the aureole that differ from those in the coenenchyme in both size and shape. It differs from *P. heliolitoides* in having denser tabularial spacing. *Pseudoplasmopora gippslandica* is a distinctly different species with a greater range (0.7 – 2.0 mm) for tabularial diameter and wider spacing between tabularia. Presence of small bud-like structures inside the tubuli is unknown in other forms of *Pseudoplasmopora* from eastern Australia, and appears to be a distinguishing feature of *P.* sp. A.

The only confirmed occurrence of *P.* sp. A is in the basal horizon of the Upper Jack Limestone Member, Graveyard Creek Formation (Late Silurian) of the Broken River area, Queensland (Hill et al. 1969).

Material
UQF52829 from Loc. B76F of Jell and Hill, 1969; UQF58203 (Hill et al. 1969, pl. III, fig. 7) here re-illustrated on Figure 8, A – B; and F11587 (Geological Survey of Queensland collection).

***Pseudoplasmopora* sp. B**
(Figure 8, C – D)

Synonymy
Pseudoplasmopora sp. Hill et al. (1969), p. 6, pl. III, fig. 8.

Description
Pseudoplasmopora characterised by densely packed (50 – 60 per cm²) very small tabularia (diameter 0.4 to 0.5 mm); generally 25 tabulae in 5 mm within tabularia. 12 tubuli (occasionally 13) forming aureoles around tabularia; coenenchymal tubuli are smaller and regularly polyhedral.

Remarks
The unusually small tabularial diameter sets *Pseudoplasmopora* sp. B apart from the other Australian forms of *Pseudoplasmopora*, though the tabularial spacing is the same as in *P. follis*. The density of tabularia (50 – 60 per cm²) is very much greater than that of *P. heliolitoides* (5 – 7) and considerably exceeds that in *P.* sp. A (16 – 18), or in *P. follis* (25 – 30).

Pseudoplasmopora sp. B was first documented from Queensland in limestone lens horizons of the Jack Formation, Graveyard Creek Group, extending into the Upper Ludlow (Hill et. al. 1969). It has been reported (but not described) from various localities in the Silurian of N.S.W., such as the Narragal Limestone and the Catombal Park and Wylinga Formations near Wellington (Munson et al. 2000).

Material
UQF60060 (Hill et al. 1969, pl. III, fig. 8) here re-illustrated on Figure 8, C – D.

ACKNOWLEDGEMENTS

For use of the facilities of the School of Geosciences, University of Sydney, I am much obliged to the Head of School, Dr. Geoff Clarke. The author thanks the Director of the Australian Museum, and the Manager of the Fossil Collections (Mr. Robert Jones), for their kindness in incorporating the author's fossil material; Dr Yongyi Zhen, also from the Australian Museum, was of great assistance in translating Chinese literature. I am grateful to Dr Barry Webby for providing some of this literature from his extensive library. The author is much indebted to Dr. Ian Percival (Geological Survey of NSW) for his perceptive comments on early versions of the manuscript; also thanks to Dr. John Pickett from the same organization for his

generous help, particularly in provision of his OZCORALS database. I sincerely acknowledge the two referees for their very thorough reviews, which have greatly improved the final version. Dr. Alex Cook and Kristen Spring of the Queensland Museum kindly made available some of Dorothy Hills' UQF thin-sections for re-examination and re-illustration. I thank Dr. Carmen Gaina (School of Geosciences, University of Sydney) for preparing two palaeogeographic base maps using Dr. Trond Torsvik's computer poles (via pers. comm.), and Mr. Peter McNiece (University of Sydney Library) for his assistance in tracking down obscure publications.

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Table 1

Comparison of parameters distinguishing species of *Pseudoplasmopora* discussed in text

	Diameter of tabularium	No. of tubuli surrounding the aureole	Tabularial spacing per cm²	Spacing of tabulae in 5 mm	Spacing of diaphragms in 5 mm	Septa
P. follis	0.9-1.1	12	25-30	10-15	15-16	absent
P. heliolitoides	1.0-1.75	12	5 - 7	12-16	15	lump
P. gippslandica	1.2-1.5	12	4 - 5	10-15	15-20	absent
P. sp. A	1.0-1.1	12	12-15	14-16	8-10	blunt
P. sp. B	0.4-0.5	12	50-60	20-25	16-18	spines

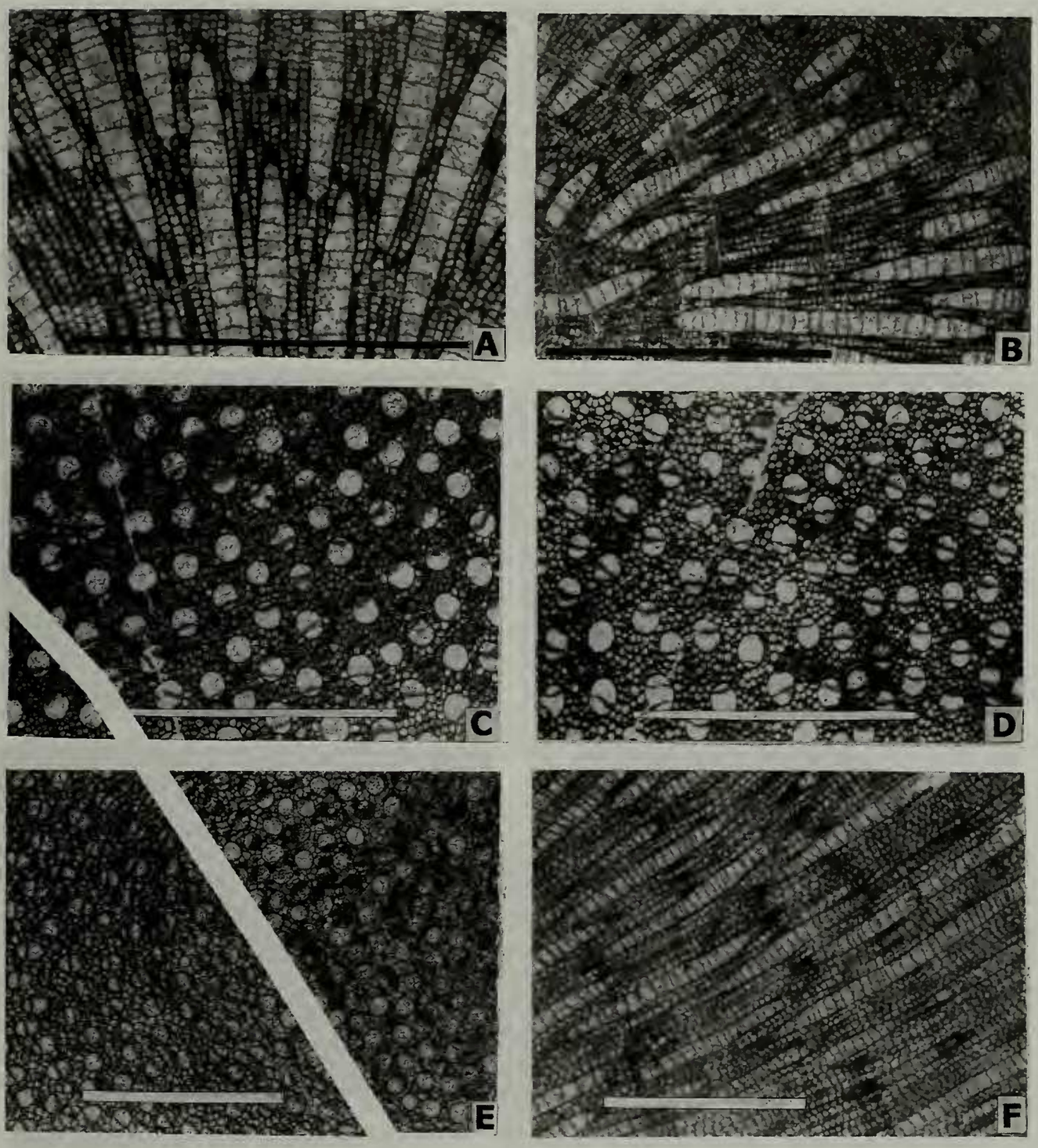

Figure 4. ***Pseudoplasmopora follis*** **A, B. Longitudinal sections of AMF105567 (AM14105) from Loc. XXX, 1.5 km ENE of "Meloola" Homestead, about 40 km NNE of Condobolin, NSW. C. Transverse section of AMF116146 (AM14098) from Loc. XX, east of "Moorefield" Station, 40 km north of Condobolin, NSW. D. Transverse section of AMF116148 (AM13783) also from Loc. XX. E. Transverse section and F. Longitudinal section of MMF31447 (Geological Survey of N.S.W.), 3.5 km W of 'Moorefield' Station, N of Condobolin, N.S.W. Scale bar = 1 cm.**

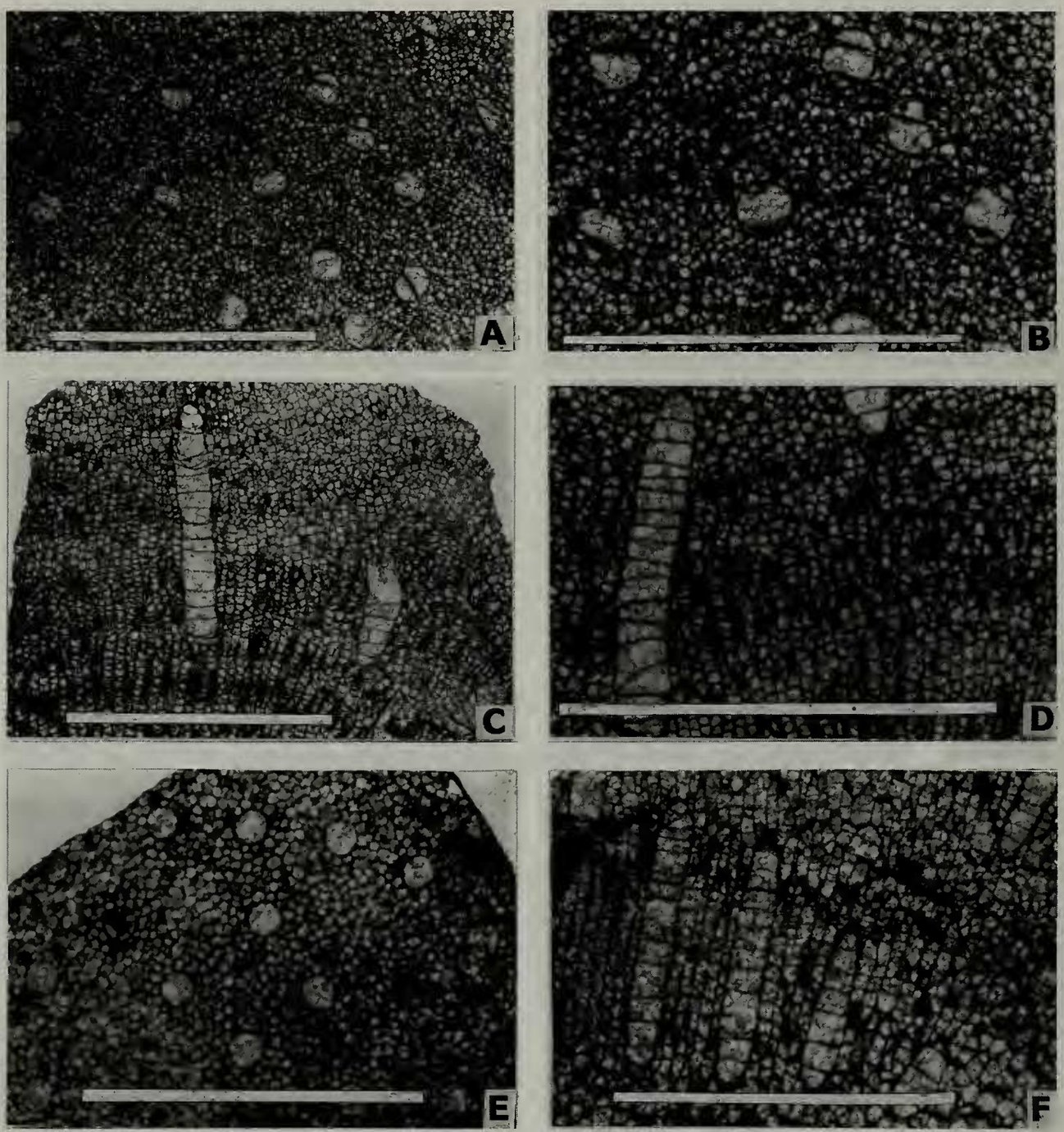

Figure 5. ***Pseudoplasmopora heliolitoides.*** **A, B. Transverse sections of AMF69668 (AM13547) from Loc. XX). Other transverse sections (unillustrated) are: AM13635, AM13772 and AM13773. C, D. Longitudinal sections of AMF69668. Other longitudinal sections (unillustrated) are: AM13636, AM13637 and AM13774. E. Transverse section and F. Longitudinal section of AMF78962 (AM257), probably from Hume Limestone scree at mouth of Booroo Ponds Creek, Hattons Corner, Yass River, N.S.W. Scale bar = 1 cm.**

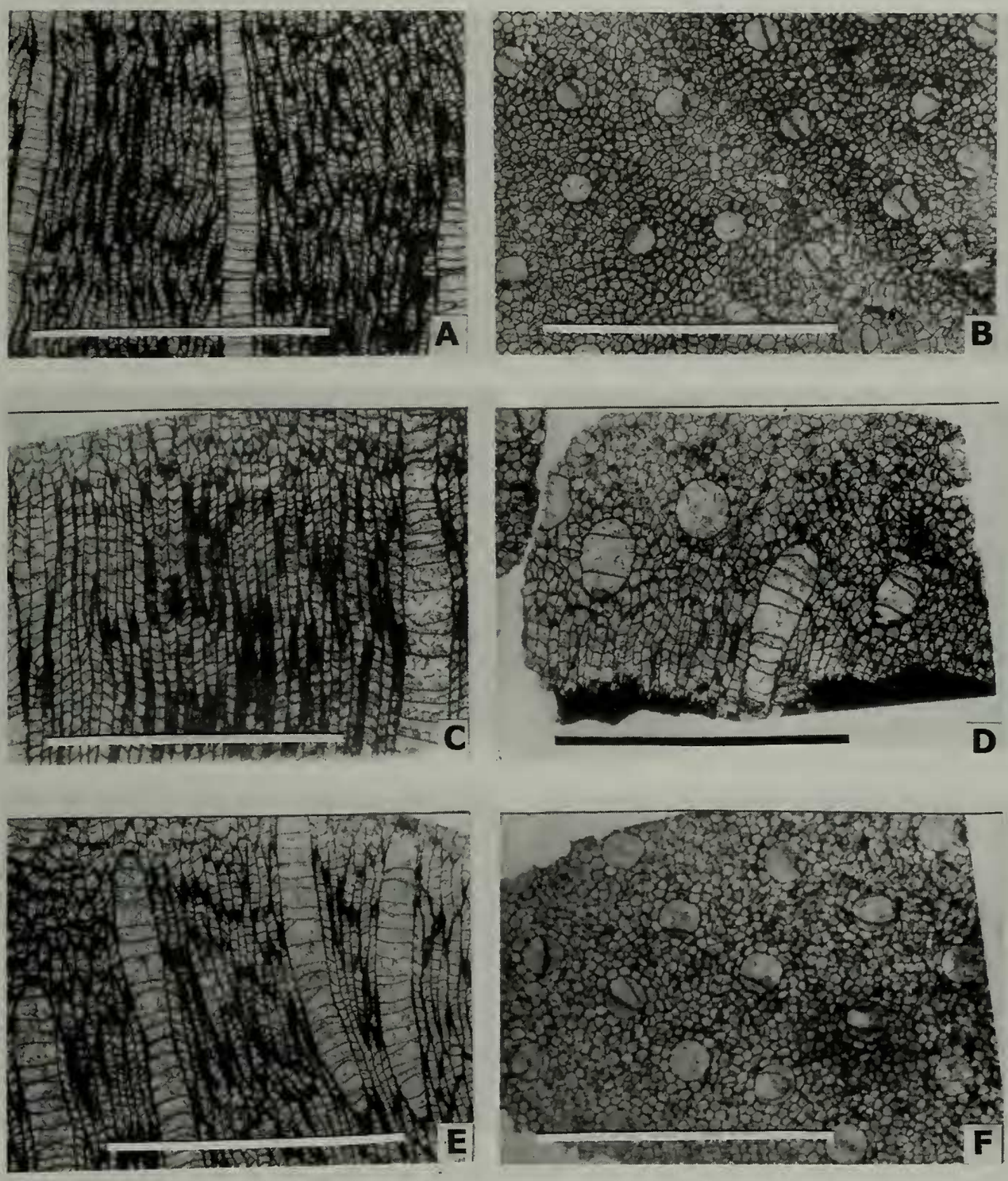

Figure 6. ***Pseudoplasmopora heliolitoides*****. A. Longitudinal section and B. Transverse section of AMF5556 (AM76), syntype of** ***Heliolites distans*** **var.** ***intermedia*** **Dun, 1927. C. Longitudinal section and D. Transverse section of AMF5173 (AM56), lectotype of** ***H. distans*** **chosen by Jones and Hill, 1940. E. Longitudinal section and F. Transverse section of AMF4082 [AM 140 (AM65)], paralectotype of** ***H. distans*****. Scale bar = 1 cm.**

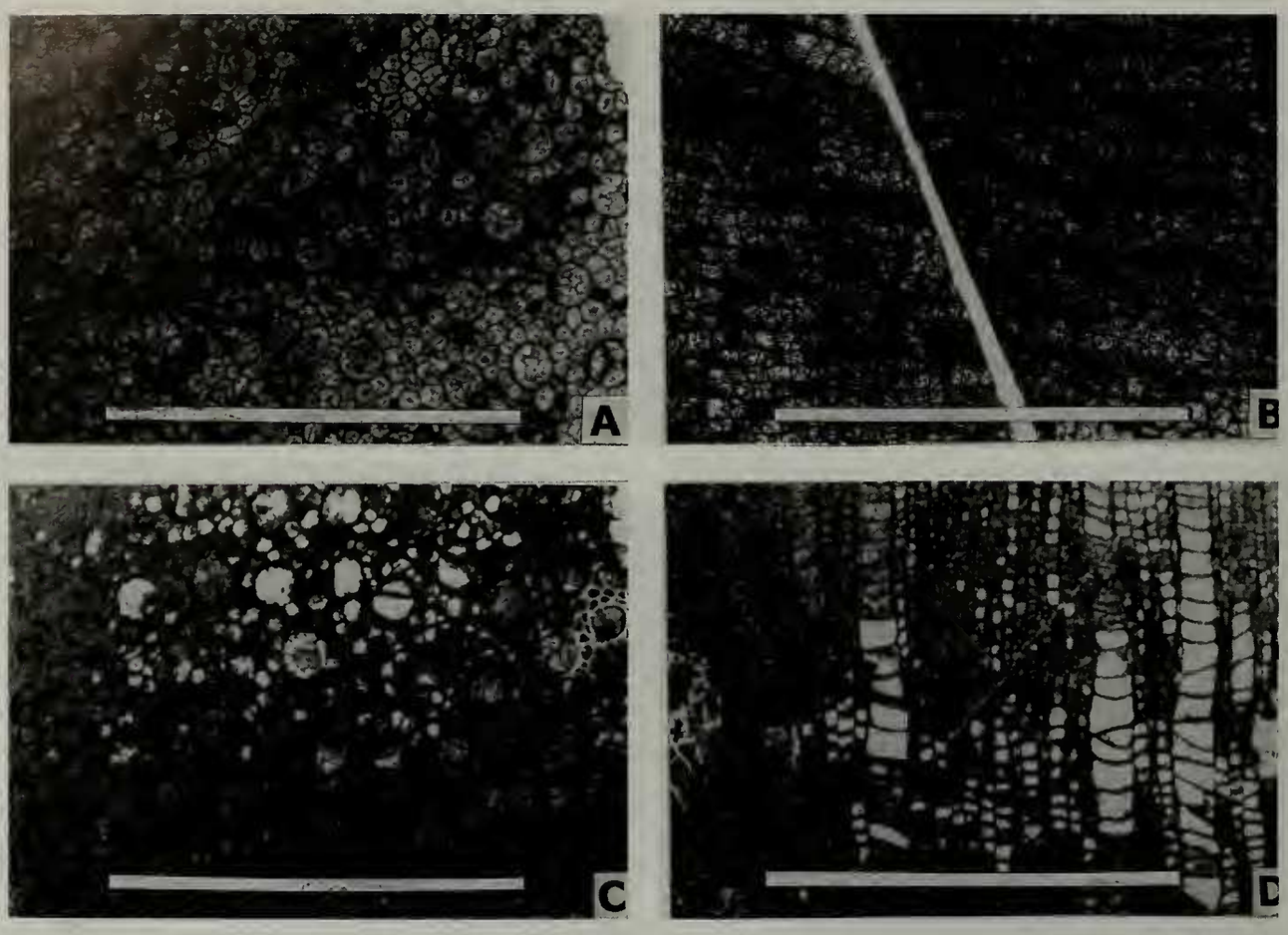

Figure 7. ***Pseudoplasmopora gippslandica*****. A. Transverse section and B. Longitudinal section of AMF5512 (AM66), near Rockhampton, Queensland, figured by Jones and Hill (1940). C. Transverse section and D. Longitudinal section of AMF6936 (AM271), Nundle Road, near Tamworth, New South Wales, figured by Jones and Hill (1940). Scale bar = 1 cm.**

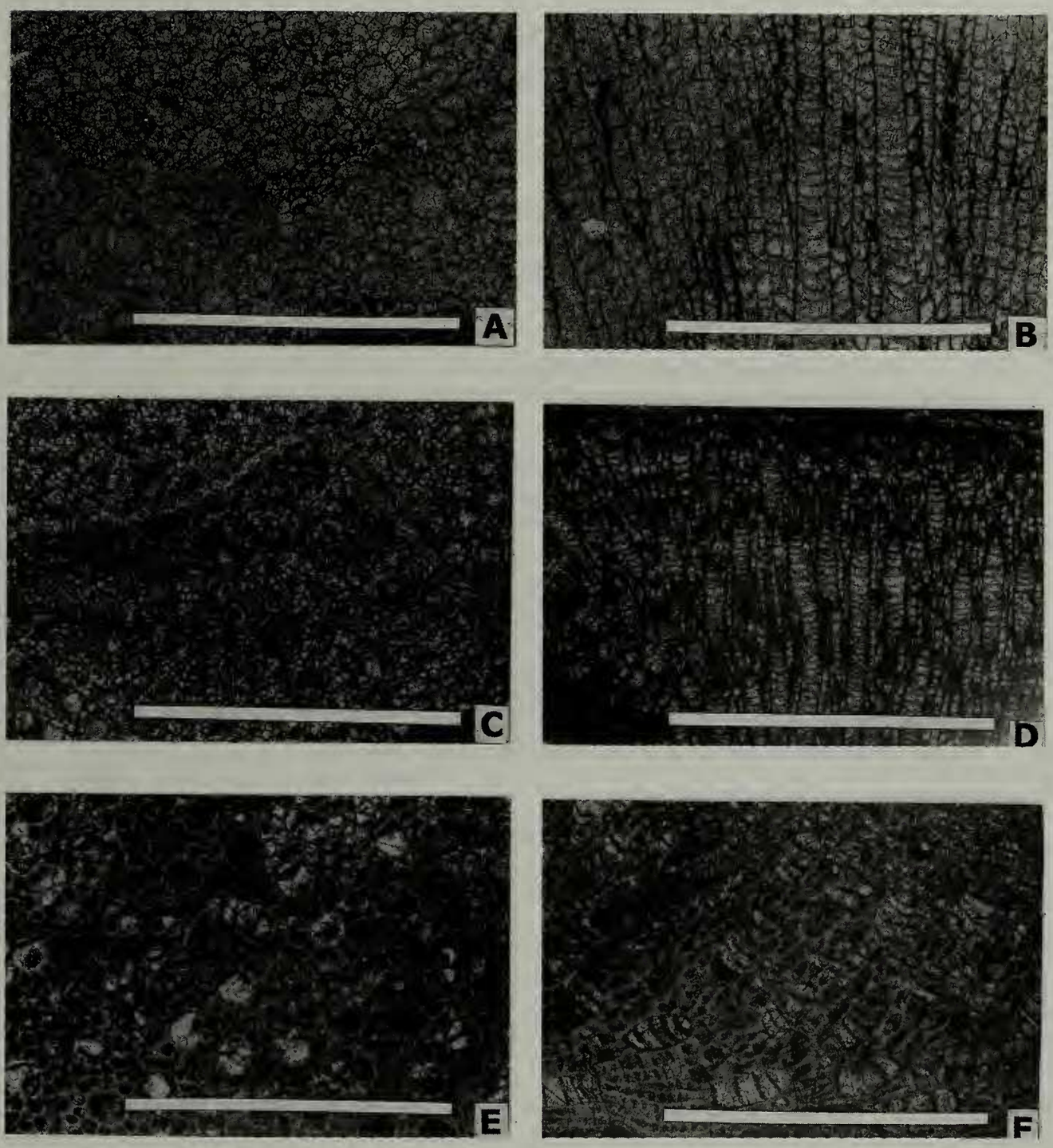

Figure 8. ***Pseudoplasmopora*** **sp. A. A. Transverse section and B. Longitudinal section of UQF58203, from Graveyard Creek Formation, Silurian; figured also by Hill et al. (1969), pl. III, fig. 7.**
Pseudoplasmopora **sp. B. C. Transverse section and D. Longitudinal section of UQF60060, from Graveyard Creek Formation, Silurian; figured also by Hill et al. (1969), pl. III, fig. 8.**
Pseudoplasmopora follis**. E. Transverse section and F. Oblique section of UQF60059, from Perry Creek Formation, Silurian; figured also by Hill et al. (1969), pl. III, fig. 6.**
Scale bar = 1 cm.